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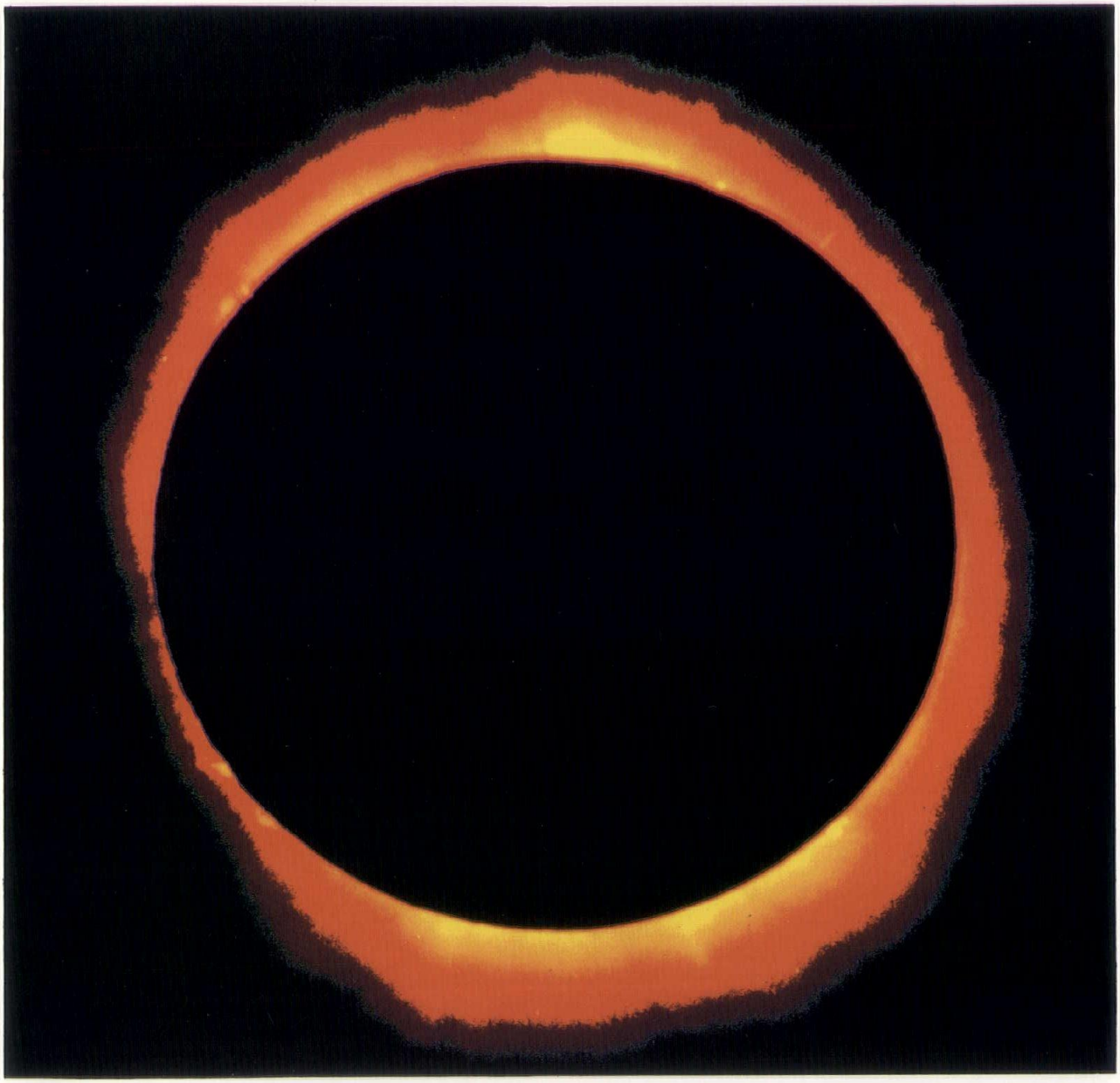

Washington Council
American Institute of Architects

A Journal of Design & Construction

September · October 1979

Comment

Energy Conservation

by COMPONENT AFFAIRS STAFF
American Institute of Architects

It is clear that many of our natural resources are in limited supply; the land on which we build, building materials, and the fossil fuels on which the built environment depends for energy.

Means must be developed to reduce our dependence on fossil fuels, which now provide about 95 percent of the United States' energy. The built environment consumes at least one-third of this energy.

In 1970 the total U.S. energy consumption of gas, coal, and oil amounted to the equivalent of almost 32.5 million barrels of oil a day. Based on present trends, it is estimated that consumption will be more than doubled by 1990 when it reaches the equivalent of 68.5 million barrels per day.

The projected expansion of domestic production of coal, gas, and nuclear energy, along with projected imports of gas and the development of hydroelectric and geothermal power, is expected to yield the equivalent of 39.2 million barrels of oil a day in 1990. The remaining demand gap of 29.3 million barrels, however, will have to be supplied from domestic and foreign oil sources.

Since domestic oil sources are expected to produce only 11.3 million barrels of oil a day in 1990, the balance—18 million barrels—will have to be met from oil imports, a three-fold increase over the present import rate of six million barrels.

Energy savings reaching an annual level equivalent to 12.5 million barrels of oil a day by 1990 could be achieved if the nation's new and existing buildings were designed to be energy efficient. This energy savings by building for efficiency is approximately equal to the future capacity of any one of the United States' prime energy systems.

These fuel savings in the built environment could be realized by 1990 through a high priority national effort to create an energy efficient building inventory. In existing buildings, fuel consumption could be reduced as much as 50 percent. New buildings, designed to be energy efficient, could save as much as 80 percent of the fuel they would otherwise consume.

Using conservative estimates of 30 percent savings for existing buildings, and 60 percent for new buildings, the energy saved would amount to the equivalent of 12.5 million barrels of oil a day by 1990.

Performance standards—annual energy consumption goals for entire buildings—should be mandated by the federal government for new residential and commercial buildings. This approach permits flexibility in the design process and encourages innovations and advancements in technology. Prescriptive or component performance standards, on the other hand, have severe limitations. In addition to restricting innovative design and inhibiting advancements in technology, they fail to address the building as an energy-consuming entity and discourage the utilization of alternative energy sources, such as solar and wind.

In some instances, it may be possible to achieve energy efficiency without additonal capital costs. On the whole, however, energy efficient buildings will tend to cost more than traditionally designed buildings. It may therefore be necessary to provide incentives to encourage energy conservation above the levels required by performance standards. In existing buildings, incentives would facilitate the raising of capital for retrofitting to achieve energy conservation.

Incentives can be offered in a variety of forms—tax credits, guaranteed loans, subsidized interest rates, rapid depreciation allowances, subsidies, or technical assistance. And the sources of such incentives can range from local communities to the federal government.

Incentives should be provided on the basis of reductions in the consumption of fossil fuels. Results can be measured in terms of BTU's per unit of area/per unit time. This approach is not unlike measuring the

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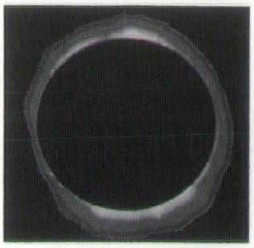

Northwest Architecture

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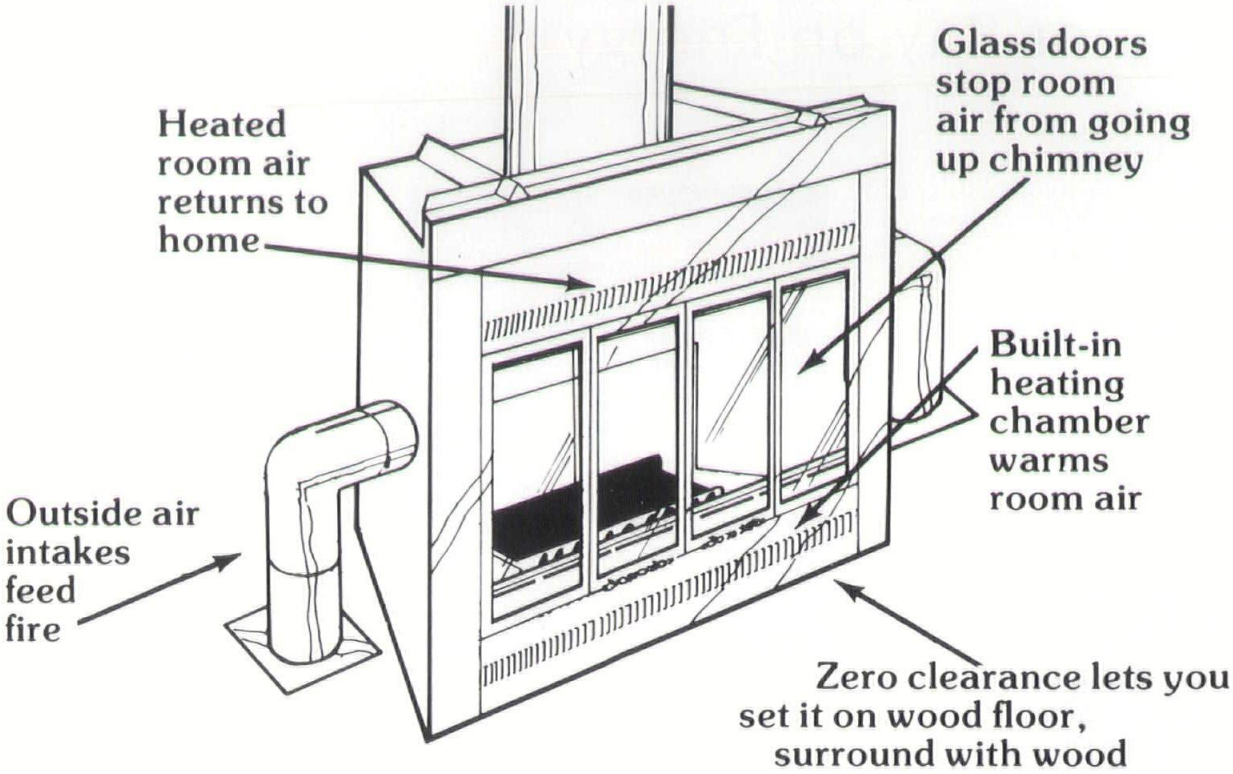

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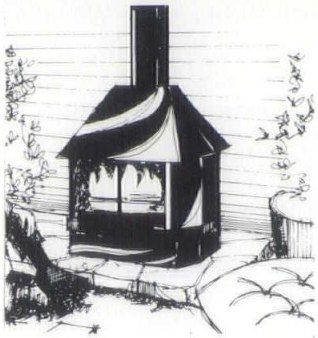

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Interview

Governor Ray on Energy

Gordon E. Ruehl, President of the Washington Council, American Institute of Architects, recently talked with Governor Ray about energy.

Ruehl: We are constantly being bombarded with a variety of opinions concerning the severity of the energy situation. What is your view of it?

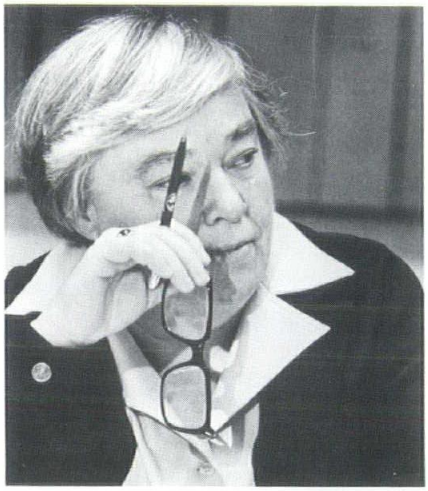
Governor: I view it as being very severe. I think most people, even those who have referred to the energy situation as a real crisis perhaps underestimate how desperate it truly is. When I say that, it's based on a belief, which I believe is amply born out in facts, that everything we do depends upon having energy available. And, the energy that we use comes primarily from fossil fuels. It is, in our state, very much supplemented with hydroelectric power. We require energy, not only for industry, but for business, for commerce and for many domestic activities. Energy is involved in everything we use. And, without the energy that comes from fossil fuels and electricity, we would revert to a primitive society. I don't think most people want to do that. But, they don't really face up to the fact that unless we take steps now, we're going to have the amount of energy available to us gradually reduced.

Ruehl: In view of the federal goal of energy independence and the growing demand for fossil fuels, how is a moratorium on exploration and mining of coal on state lands justified?

Governor: It isn't. It isn't justified.

Ruehl: There are, however, coal supplies in the state?

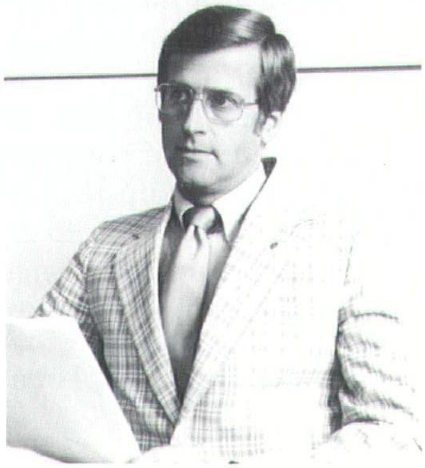
Governor: We have one very large coal burning plant. It operates a strip mine in Centralia and that's a very good operation. Two years after coal has been removed from the ground, you couldn't really tell that it had been strip mined. It's an area that lends itself very well to rehabilitation of the land. We also have a lot of coal in the foothills of the Cascades. It would be very expensive to mine, and it's rather low in BTU's. But, the seams go down in about a 45° angle, and therefore, it is a very good candidate for going in at the low level and trying gasification. And, that's what we're trying to resolve.



Governor Dixy Lee Ray is completing her third year as Governor of Washington State. Prior to being elected governor, as a biologist, she served in numerous federal government positions including Special Consultant in Biological Oceanography to the United States National Science Foundation; Chairperson of the Atomic Energy Commission and United States Assistant Secretary of State, International Environmental and Scientific Affairs. Currently, she serves on the Executive Committee of the National Governor's Association.

Ruehl: Having recently returned from a meeting with President Carter at Camp David and the National Governor's Conference, what is your view of his recently announced initiatives concerning the energy situation?

Governor: The President's initiatives are a step in the right direction. The only problem is that we can't get there, unless other things are done. Little of what the President has proposed is possible. What I mean by that, the biggest cornerstone of his program is the synthetic fuels part of it. What does that mean? It means that in this country we should take the coal, and we have about 30 percent of the world's known coal, and we should convert that coal to clean usable liquid or gas. The only problem is that it takes a long time to build an industry. All of our experi-



Gordon E. Ruehl, AIA, is a principal in the firm of Walker/McGough/Foltz/Lyerla, P.S., Architects and Engineers in Spokane. He has maintained an active involvement in professional groups and community affairs throughout his career and is currently serving as President of the Washington Council, American Institute of Architects.

ence for the past 200 years has shown us that when the process; when all the scientific principles are proven; when it's been tested in the laboratories so you know you're going to be able to it; it takes from 10-25 years, if there are no problems, in order for it to become commercialized on a scale big enough to have it widely available at prices people can afford. Secondly, there is no such thing as a perfect technology. There is no such thing as a fuel that doesn't have some waste problems. And, we cannot have, or continue to have, the existing laws covering pure air, clean water, no impact on natural living creatures—"endangered species"—or what have you, and still have energy. There is no way we could build the plants that are necessary to take the coal and turn it into something cleaner without greatly, fundamentally, modifying the exisiting environmental laws and, the system under which those laws operate which make it possible for anyone to bring a court action and stop everything. We're paralyzed. That is not recognized in the President's program; at least not indicated. After visiting a Kentucky coal burning plant recently, apparently he said that he approved and encouraged the mining of coal, but without any environmental impact. You can't do it. You might as well as say let's have a baby that doesn't dirty the diapers.

Ruehl: Are new sources of energy a viable alternative?

Governor: We have to provide for new supplies. When I say new supplies, that doesn't mean something unknown at the present time. It means that we should be increasing our exploration for more existing oil and natural gas. There was just a commercial find of natural gas in Northwestern Oregon. It may be that the same formation exists in this state. This state doesn't have any indigenous natural gas or oil that is known about. And, yet there are some possibilities. But, there has been very little exploration. We know that despite the likely discovery of more pockets of natural gas and petroleum eventually the world will run out, and that is why a lot of people have been thinking for a long time—what can we do? The answer, and I still think the best answer, is nuclear power. People began thinking about that in the 1940's, to use the energy of the basic structure of matter itself. It is an inexhaustible energy source. And, the fact is, if we're able to overcome our unreasoning fear of radiation, and recognize that it is part of the natural world, and always has been, we would have enough resources in this country, even without nuclear fusion which is a great hope for the future.

Let's talk about some of the things that aren't used that people have great hope for. Some of the hopes that are being encouraged for what can be done with solar power are beyond our technology. And, it won't happen quickly. Nevertheless, particularly from the standpoint of architecture, much can be done with what's called passive solar. This will have to be accompanied by rules and regulations, even laws, guaranteeing sunshine rights so that you can't have things that will shade a solar collector, something of that sort. And, certain parts of our state are much better adapted to it than other parts. Certainly in Central Eastern Washington there's much more potential than in Western Washington. Even so, there are things that can be done.

Active solar technology is good enough today to probably become competitive from an economic standpoint for heating water. But, to think that we can do things on a single building, or a group of buildings, or home by home basis to convert solar into electricity, no.

Let's look at windmills. Human beings invented windmills to do a job that they do very well indeed, and that's pump water. Let's use windmills to pump water for lots of purposes instead of using diesel engines, or electrical motors. We have a lot of irrigation water that has to be pumped. We have hot water below the ground. Unfortunately, we've tied up all our good hot springs into national parks and resort areas where we can't do anything with it. We have to rethink that. Japan has developed small turbines and electrical generating plants of about 50 megawatts for use in hot springs in their national parks. They have built them so that they are nice and attractive and fit into the environment. They're making use of all that energy we're wasting.

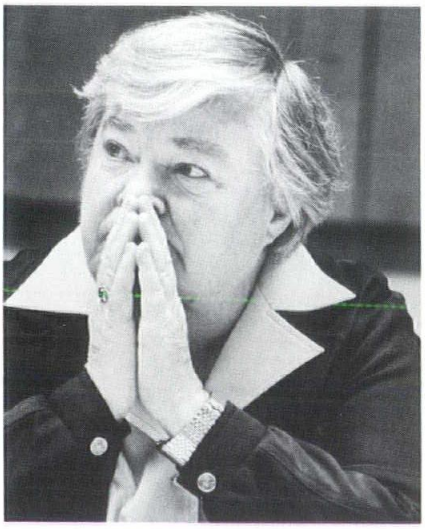
We could do the same thing here. We have a number of different areas where reasonable amounts of thermal energy could be used either for direct heating which is now, of course, an idea, or for electricity production. In Eastern Washington there are areas where there's hot water above the boiling point. It's about the right temperature for the food processing industry. Food processing plants

should be located right in those areas where they could use that water directly to heat the water for food processing thus saving the natural gas. There are lots of things like this that could be done. And, they should be done. People talk about diversifying. These are the kinds of things that I think are really important to emphasize and these are the kinds of things that can be done.

Ruehl: Where do you place conservation on the priority totem pole of energy programs?

Governor: People talk very grandly about conservation, and I don't think people believe that it affects them. What does conservation really mean? Doing with less! Alright, let's face up to that. Do we really want to cut down the use of electricity in cities and towns? Do we want streets to be illuminated? Do we want traffic lights? And, I'm just mentioning some of the more obvious things. What about the products that we use? I look around the desk here, from your tape recorder to the microphones to the clothes that we wear. They are made out of petroleum and petroleum products. Yet we seem to think that we can get along with a lot less of it and still have these things. Do we want to do away with them, or just have them available only to a few people? It is time people face up to these questions...now. It isn't that we might immediately be without fossil fuels, because we know perfectly well that the world supplies are limited in a finite way. We do, in fact, have an ample supply of some kinds of fossil fuels, enough to last for a few hundred years at a minimum. And, can't we imagine that in a few hundred years some of the problems with their use can be solved. We've solved a few problems in the past 200 years.

Ruehl: What is your view of our dependency on other nations for our energy needs?



Governor Ray

Governor: The important thing that we face right now, and the reason the crisis is upon us is not lack of energy, or even so much the lack of our will to use it, but it appears to be a lack of understanding of what the world is really like. The world, whether we like it or not, is made up of sovereign nations. No nation is going to carry another nation if its economy falters and slides down. What nation is going to have an aid program for the United States?

Nearly half of our energy comes from part of the world where those nations cannot be said to be great admirers of the United States. And, that's why it is such a crisis. At any moment, any one of the Middle-East nations could cut off our supply, and we would be reduced to one-half of what we have now. That would be sufficient to cause the most drastic social upset. But, few people seem to be thinking about it that way. We've been so brainwashed by people who tell us that we are wasteful. And, I would really challenge that by the way.

Yes, we use more energy per capita than any other nation. We also have a higher standard of living. But, do our citizens really want to lower their standards of living? And, if so, by how much? People talk about it as if it will only affect other people, not them. We have seen what has happened when gasoline has become more expensive and somewhat in short supply. People don't like it very much. What if gasoline was not available except for crucial emergency purposes and allocated by government to only a few privileged people. Could you imagine what would happen in this country? That is where we are headed if we don't rely more on our own resources.

Ruehl: During the recently concluded legislative sessions, both the legislature and your office were criticized by some of the press and others for not having a comprehensive energy program for the state. What is your response to this criticism?

Governor: For not having a comprehensive energy program? What do they mean? The State Government does not develop and make energy and is not in the business of marketing it. So, what is it the state could or should be doing? We don't have a crystal ball. Your judgment is just as good as the judgment of the government clerk. I'll use that term rather than bureaucrat. Why should they have any special insight? Most of

them are not architects or engineers or technologists that understand the sources of supply and so on.

Let me give you two or three examples. The City of Seattle spent an enormous amount of money and gathered the best minds they could find to do a very careful study in the future of electricity and electrical power for the City of Seattle. It was called Energy 1990. And, that study was put out in 1976. I think that was the year. They determined conclusively that Seattle would not need any new generating capacities until the end of this century. They ran out of capacity last winter.

The Pacific Northwest Regional Commission spent, I think 4 million dollars on a regional energy plan to try to develop a model that would forecast and so on. When it was completed, the group reported it to the commission. They had developed the model and it turned out that by the time everything was put together into a report, and so on, two years went by. So, I said to them, "Alright, now we've had two years since you did this. If we took your model and applied it to what actually happened in these last two years, what is the result?" It didn't fit. It had forecasted an increase in electrical use of less than two percent when the increase was actually four and a half percent.

Ruehl: How can government and private enterprise better coordinate development of a strategy to deal with the energy situation in our state?

Governor: Get government out of the business of trying to regulate industry, then there will be better development. Deregulate. The government can provide information as to what is being done in the private sector and what resources there appear to be. As an example, government is involved in trying to assist private industry in getting a pilot plant in this state to institute gasification of coal. The government is helping through special removal of taxes and that kind of thing to encourage the use of gasohol. The Federal Government could do a lot. But, mainly, the initiatives for production of supply and for marketing should be in the private sector. As you may see, I'm a very strong private enterprise person. Of course, the government will have to be involved if energy supplies fall too low, and there is not enough to go around. It will have to be rationed which is a role of government. The government can help with an educational program by providing the materials and information, but it is through the private sector that the product comes out. But, government must not be in the business of producing and marketing.

Ruehl: Objective projections concerning future energy sources availability is a critical issue to building designers. The primary sources available to the designer now are the suppliers, and their views may be somewhat biased toward their own product. Will state government be assuming more of a role in this realm in the future?

Governor: Not really. It would be illegal for the state to do that. The state cannot really take a position that could be interpreted as encouraging one business over another. In other words, we could not undertake a campaign to urge people to use one kind of energy over another. We can answer questions that provide information. But, the state cannot undertake real guidance with respect to what particular kind of energy should be used. It would be against our constitution.

Ruehl: What can the architectural profession and other construction-related organizations do to be of assistance in dealing with the energy situation in our state?

Governor: You can do a great deal to secure better understanding of what the real situation is. People are apt to, especially with a lot of propaganda, accept easy answers that are truly not so. Accurately informing the general public, is a very difficult but necessary thing to do. The assistance of every professional organization will be, I think, essential before people will really look clearly at the role that energy plays and some of the things that must be done if we are going to be sure that we have enough for our future needs.

Developing A State Energy Code

by CHRISTOPHER WOODSUM
Staff to the State Building
Code Advisory Council

The growing concern over the cost and availability of various forms of energy has intensified the debate over the role of government in developing new building codes to encourage energy conservation..

The building industry has tended to challenge new codes and regulations on the basis of added construction costs. Design professionals challenge building codes that they believe limit design freedom. Building officials are concerned about the additional time and resources needed to enforce new codes. State and local governments respond to federal mandates (laws) and incentives (grants) to establish codes and regulations that meet federal standards. Citizens are caught between government and industry -- and must pay for the actions of both.

The State of Washington has joined other states in moving toward a mandatory energy code for new construction. The State Building Code Advisory Council was directed by the 1979 Legislature to adopt a state-wide thermal efficiency and lighting code by June 30, 1980. The Council established an Energy Code Committee and has begun the task of developing a state energy code, based on ASHRAE 90-75.

In September, the first draft of the proposed energy code was sent out to industries, associations, and individuals that requested an opportunity to review technical aspects of the proposed energy code. This review is occurring during the months of October and November and includes an opportunity to discuss modifications with the Energy Code Committee.

By the end of November the revised code will be submitted to the full State Building Code Advisory Council, Federal Department of Energy, and state legislative committees for review. During the spring of 1980, (legal) public hearings will be scheduled around the state, leading to formal adoption of the State Energy Code by June 30, 1980.

Those working on the energy code feel that actual code development is about half of the problem and challenge. Of equal concern is the effect that substantial new code requirements will have on design professionals, the construction industry, and building officials. A major effort is being made to keep the groups most affected by building codes informed about what is occurring and to prepare them for the new code requirements. The Washington State Energy Office is providing technical assistance to the Energy Code Committee during the code development process, and will be responsible for developing a training program to assist the public and private sector to apply and enforce the state energy code.

The State Planning and Community Affairs Agency (PCAA) provides staff support to the State Building Code Advisory Council and has an ongoing commitment to work with local city and county jurisdictions in response to legislative and executive actions. PCAA also wants to make sure that all groups affected by building codes and code enforcement have an opportunity to provide input during the development and implementation of the code. (Questions, comments, and requests for information should be sent to: State Building Code Advisory Council, c/o PCAA, 400 Capitol Center Building, Olympia, Washington, 98504.)

The debate over the role of government in the area of building codes will continue. In Washington, the development of this state's energy code will be a measure of how well we have listened — and applied what we have heard.

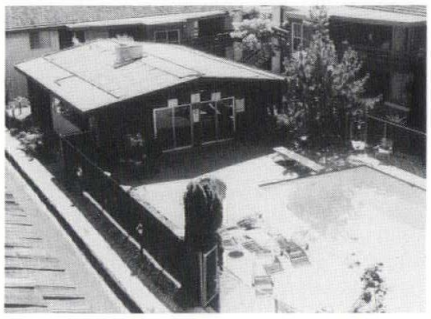
Study

Putting the Sun to Work

Washington Natural Gas Company's Approach

Four-panel solar assist, water-to-air, space heating system. Jorgenson Construction.

Overlake School, Redmond. 60-panel solar system, air with rock storage.



SeaTac Garden Apartments. 18-panel solar system (720-feet) for swimming pool.

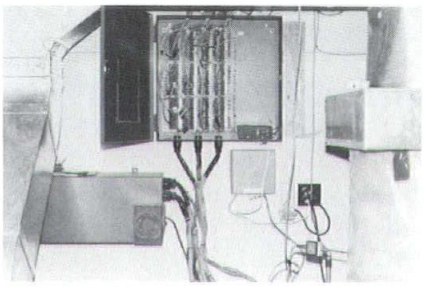
The Washington Natural Gas Company believes solar energy is a viable alternative means of energy for the present and future. Being a primary distributor of natural gas, the gas company's objective is to offer consumers another practical energy source.

WNG's efforts to demonstrate how well solar heating can work have included the monitoring of performance for some of the solar systems. The first project, started in 1975, was Solar Home I. This small pilot retrofit project consisted of a four-panel solar assist, water-to-air, space heating system. Seattle University assisted in the monitoring. The project provided encouraging data and valuable knowledge was acquired.

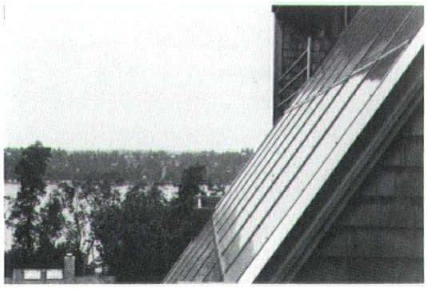
With this experience, WNG decided to build a full scale residential structure demonstrating an active solar system complemented by a passive design. An architectural firm with considerable experience in solar design, Mithun and Associates, was commissioned to design this dwelling which would be called Solar Home II. Technical Services people at WNG and Thermal Efficiency, Inc. (TEI) worked closely with the architect and Solaron, the manufacturer of the solar equipment. A HUD grant was received under the National Solar Heating Demonstration Program to monitor Solar Home II for up to five years. Boeing is the instrumentation contractor for all HUD monitoring projects nation-wide. Their close proximity provided a unique cooperation for sharing of information and experiences.

Solar Home II, a spec-built-home by WNG on a hillside near Lake

Puget Sound National Bank, Normandy Park Branch.



Wiring and Telecommunicator for Solar Home II monitoring.



Solar Panels on Solar Home II.

Washington, was a blending of contemporary design with modern energy science. The 2,860 square foot home was completed in November 1977. Open house was held during the next ten months for over 4,000 visitors from the public, professional and educational sectors in Washington state.

The active system consists of 28-flat plate collectors (500 square feet aperture) with air as the transfer medium to space heating or a pebble bin storage (6.5-foot cube). The array faces south with a tilt angle of 57°. The domestic hot water is heated by an air-to-water fin-coil heat exchanger located in the hot air duct from the collector array outlet. The passive solar design includes 500 square feet of south facing double-glazed windows.

The data collection for the HUD monitoring in Solar Home II is subcontracted to IBM; 8,640 numerical measurements per day are produced at 30 points of monitoring and reduced to monthly performance reports. WNG's monitoring includes actual energy bills and owner input in comparison to statistical average non-solar homes of similar size. Even though some system adjustments and fine tuning have just been completed, the accumulation of data is indicating a forty percent active contribution plus an accompanying forty percent passive contribution. When all the results are in, we may expect to find that an active-passive solar system combination will be more efficient than extremes either way.

LEARNING

Fine tuning and balancing of Solar Home II's solar system did not come about without some difficulties. Even

though the ductwork and connections in the collector/storage loop were sealed and insulated, some hot air leaks were detected from the rock storage lid and infiltration to the collector manifolding. The day the storage leak was resealed, the IBM computer in Huntsville, Alabama, where the monitoring is received by telephone line, detected the increase in efficiency. The air infiltration in the collector manifolding was determined to be from the semi-heated mechanical room, and therefore not a negative effect. Design air flow through the collector loop was 1,100 cfm. Initially, there was difficulty in achieving 900 cfm. but with a ductwork streamlining modification, 1,200 cfm. was reached. A recent control temperature limit device was installed to lock-out the auxiliary heating as long as the storage temperature was above 100° F. The existing two-storage thermostat was designed for this function but did not allow for a room temperature change of more than 1.5° or a night setback practice.

Careful observation of the monitoring over the last year has also revealed some impressive performances. Solar collector air flow temperatures on clear days in May consistently exceed 195°, limiting out the rock storage at 155°. On medium overcast days, collector temperatures have reached 145°. In January, when daytime outside temperatures average below 40°, collector temperatures exceed 140° on clear days and rock storage was in the 120° range.

The ongoing monitoring of other solar system hot water heating on WNG's own Totem Lake Operating Base, for employee showers, has provided immediate performance information in relation to sky conditions. Under good sky conditions collector temperatures were recorded up to 240°. This indicates a slower than optimum flow rate across the collectors and has been adjusted. Nighttime thermosiphoning was detected even with a check valve and was causing heat loss from the 200 gallon storage tank. Installation of a positive shut-off cellonoid valve was the solution.

To determine the bottom line solar performance of the system, a method of turning the system off on alternate weeks was implemented. Energy used by the backup gas water heater, solar intensity, temperatures, and gallon consumption were recorded and compared. The sonar fraction for March 1979 was 75 percent. This process may seem too simple to be accurate but Boeing and DOE officials have concurred that this method is a fairly accurate alternate to the sophisticated and complex monitoring for the National Solar Data Program.

The Solar Department at WNG also will be monitoring the second and third solar branches of Puget Sound National Bank (Don Burr Associates, Architects) nearing completion in Burien and Port of Tacoma. The solar systems for both of these new buildings will be 40-panel (780 square feet) air heating with pebble storage.

The spin-off from this monitoring is far-reaching. Improved installation methods for existing solar technologies are being developed and used. An accurate and thorough startup procedure must be practiced.

SOLAR SAVINGS OR EARNINGS?

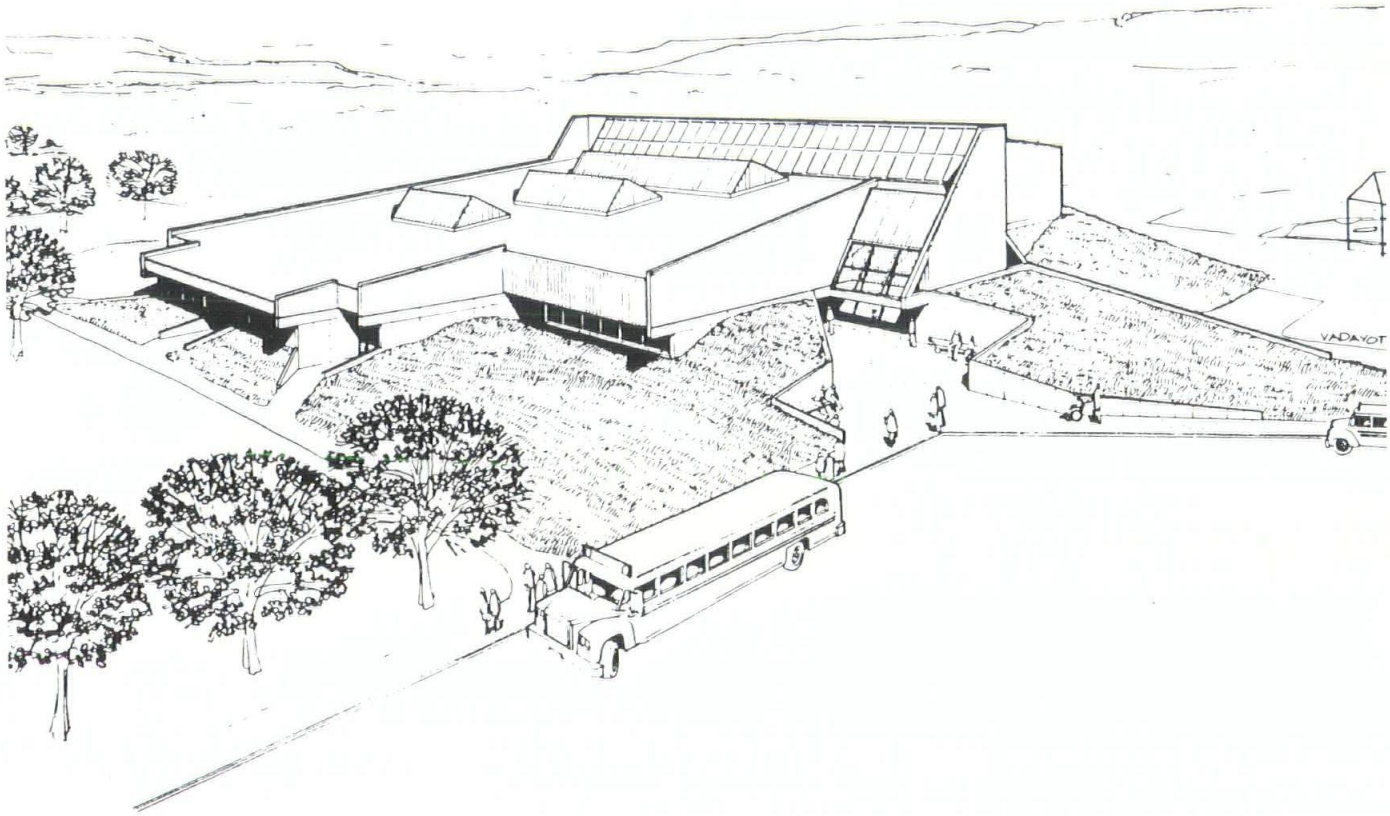
Many methods for figuring the "pay back period" become less valid when the solar system is purchased as a capital investment resulting in attractive returns upon resale, as well as monies earned on producing one's own solar energy. Federal solar tax credits of up to 30 percent can provide a positive cash flow the first year and Washington State property tax exemptions on active solar systems can save on a yearly basis. It may be more expensive not to invest in solar heating systems.

WNG's sister company, Thermal Efficiency, Inc. (TEI), is a distributor of solar equipment in a four-state area. WNG installers and TEI dealers have installed over 72 active solar systems in the last three years, 55 of which are in Western Washington. These applications include:

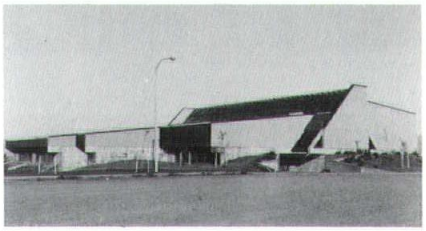
Residential domestic solar hot water systems	15
Residential space heating and hot water systems	6
Commercial hot water systems	1
Residential swimming pool solar systems	43
Commercial swimming pool solar systems	1
Financial institution solar systems	5
Fire station solar system	1
School solar systems	1
	73*

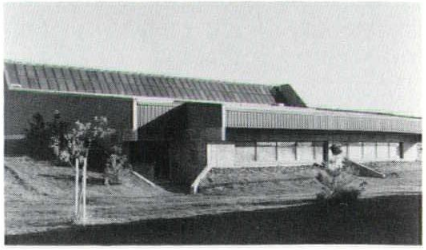
*Numerous other solar projects are on the drawing boards.

Wahluke Slope Middle School



Project	Wahluke Slope Middle School
Owner	Wahluke School District No. 73
Architect	Environmental Concern Inc. Architect/Planners
Contractor	Ralph Redding
Structural Engineer	Peter Suden
Mechanical Engineer	Rice & Luhn
Electrical Engineer	Wanless-Cook Associates





Solar energy is playing its first major energy role in the schools in the state of Washington with the completion last year of the Wahluke Middle School in south-central Washington. One year after completion, the school is performing to the solar standards established when designed. The system was programmed to realize savings of approximately 35% in energy costs over the next 15 years, about a $50,000 savings on a 25-year curve.

The Wahluke Slope School site is a natural area for the harnessing of solar energy since it has the most frost-free days of any place in the state. The system, designed for the 20,074 sq. ft. facility, can be doubled in size in future years if energy costs continue to increase.

Three energy gathering panels are utilized for a total solar collection area of approximately 1600 sq. ft. with a southern exposure. The solar energy heats the panels which have a water/anti-freeze solution flowing through them carrying the heat to a storage container which heats water to about 160°. The heated water is used throughout the building for space heating and domestic hot water use. When there is not sufficient sun to heat the water, a thermostat overrides the solar heating system and starts up an electrical boiler.

Also designed into the school is a passive heating system. Venetian blinds, black on one side and white on the reverse, are hung in classrooms and administrative offices. These face south, the only exposure in the building with windows. For more heat, the black side is turned to absorb the sun's rays; for less heat, the white side is turned to reflect the sunlight.

SOLAR SYSTEM ECONOMICS

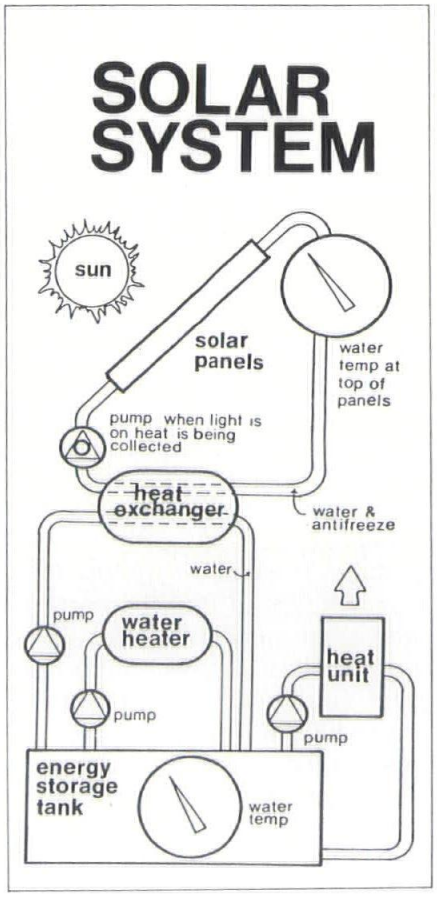
25 Year Cost Analysis

Installed Cost = $56,800
@ 5% For 25 Years = $4,030/1st year x 25 yrs = $100,750

Added Maintenance Required = $375/1st year
@ 5% Inflation for 25 years = 17,900
Total 25 Year Cost $118,650

Energy Savings = $815/1st year
@ 8% Inflation for 25 years = $59,800
25 Year Deficit $58,850

@ 15% Inflation for 25 years = $175,200
25 Year Savings $56,550



INSULATION ECONOMICS

Roof savings = 31,100 KWH/Year
@ 1.4¢/KWH = $435/1st year

Wall System Savings = 47,500 KWH/year
@ 1.4¢/KWH = $665/1st year

Total 1st Year Savings = $1,100
Over 25 years at 8% inflation = $80,700
At 15% inflation = $236,500

Installed Cost: Roof = 3,300.00
Wall System = 490.00
Total 3,790.00

At 5% interest for 25 years = 219.82 per yr.
219.82 x 25 = 5495.50 for 25 years

Berming Savings = 23,700 KWH/year
@ 1.4¢/KWH = $350/1st year

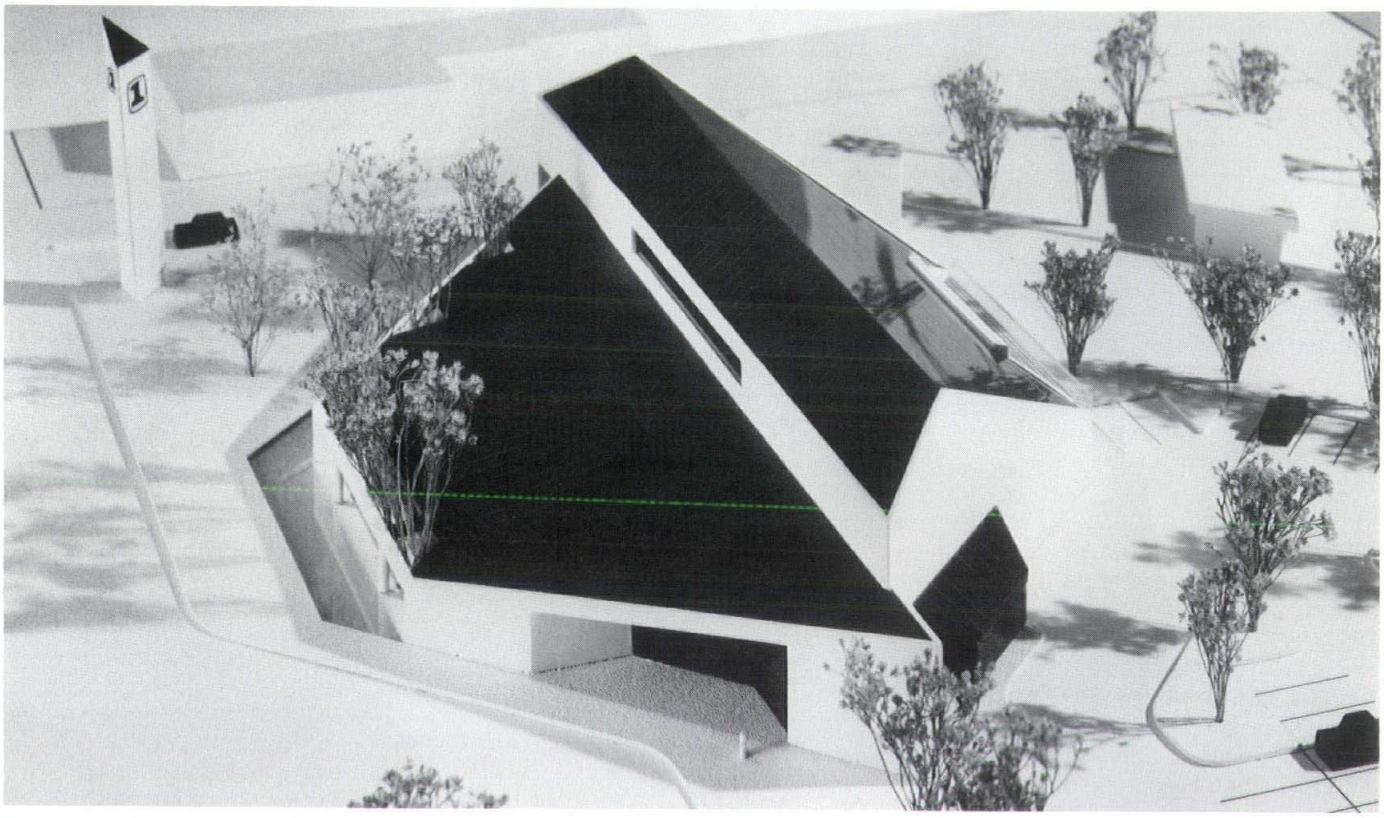
Over 25 years at 8% inflation = $25,700
At 15% inflation = $75,300

Installed Cost = 12,425.00

At 5% interest for 25 years = 720.65 per yr.
(720.65) x 25 = (18,016.25) for 25 yrs.

The school has six classrooms from grades five through eight, plus science and home economic rooms, a kitchen and a multi-purpose cafeteria/gymnasium. The $1.4 million school, completed in August 1978, was constructed to meet a 20% student population growth experienced in the last three years.

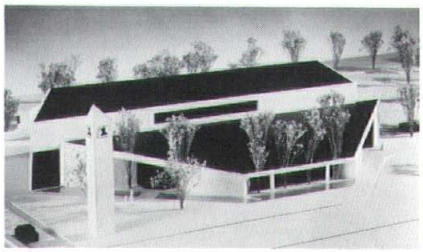
Richland Branch, Seattle-First National Bank



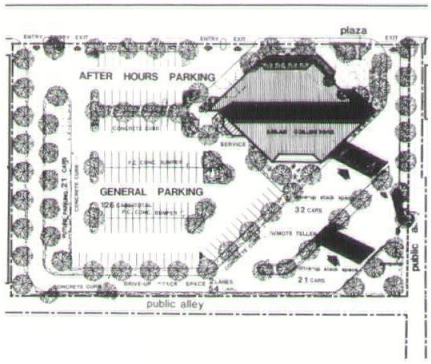
Project	Seattle-First National Bank Richland, Washington
Owner	Seattle-First National Bank
Architect	Will Quam, AIA
Contractor	The Austin Company

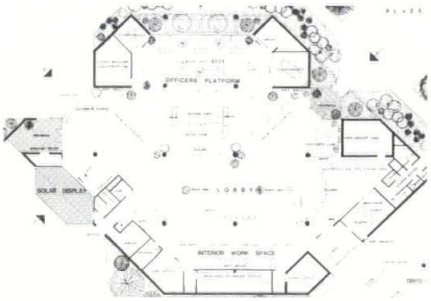
The criteria for the new Richland branch of the Seattle-First National Bank was particularly challenging. The service area encompasses the fastest growing market area in the state, fueled by a base of nuclear technology, ample water and a mild climate. The bank needed to recognize the type of market and climate and, at the same time, provide superior facilities to meet not only present but future needs in a method compatible with requirements of the market, the customers and the staff.

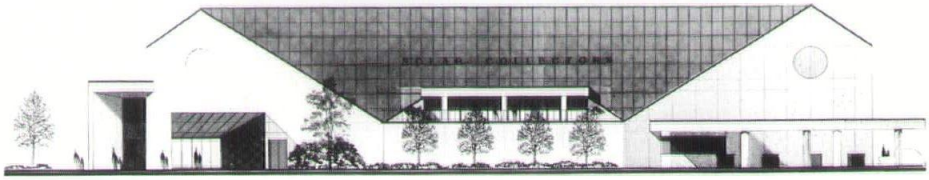
The total design was to reflect the advanced technology of the scientific community of the Tri-Cities area.



The design responded to this challenge in a number of ways: the structure incorporates two trapezoidal volumes, displaced laterally along a common plane, which also becomes the ridge of the steeply sloping roof; the skyward facing surface of the larger element becomes the solar collecting array which serves an advanced environmental system calculated and designed to







SOUTH ELEVATION
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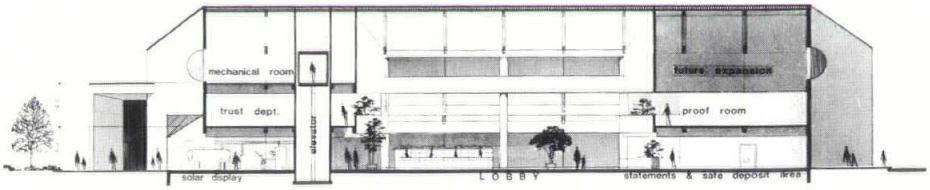
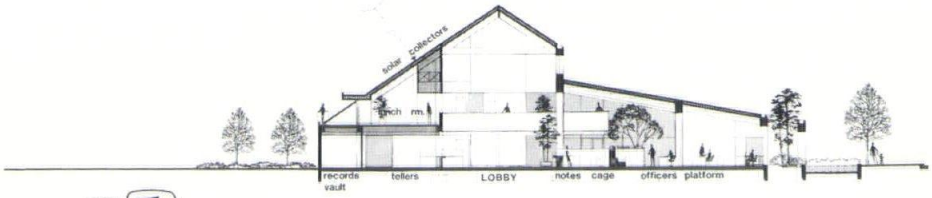


SECTION A-A
scale 1 8 : 1 = 0

EAST ELEVATION
scale 1 8 : 1 = 0



Seattle First National Bank
new branch bank
richland, washington

SECTION B-B
scale 1 8 : 1 = 0

be capable of supplying 70% of the heating and 50% of the cooling from the region's abundant hours of clear sky, reducing electrical energy consumption significantly.

Exterior walls, insulated to comply with the national energy guidelines, are finished in white stucco to reflect unwanted solar radiation and contrast sharply with the black roof and solar panels. Interiors, in three levels, open vertically to the roof in several areas. A main floor feature is the glassed-in solar equipment room.

Interior design complements the lofty geometrics with clear, clean colors, oiled light oak millwork and citron-orange pile carpeting. An interplay of deep brown and white on the walls and accents of chrome and glass create visual punctuation of departments and functions.

How to put your building on a strict Btu diet.

Energy, as we all know, is money. It disappears faster than we can put our fingers on it.

Soon, every one of us is going to have to start budgeting energy. The high costs of energy, as well as government regulations, are going to demand a strict accounting of the way our buildings consume energy.

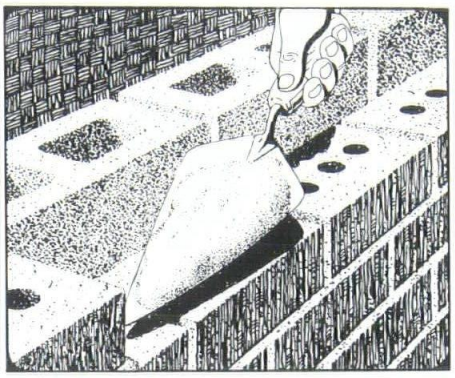
But there are ways to make a Btu stretch farther. We believe there are four important things that every business manager should know about cutting down energy expenditures:

1. *To do a good job of saving energy, you have to be concerned with the energy performance of the entire building,* not just a component like the walls, or a single system like heating and cooling.

Every facet has to be taken into account. The mass, or weight, of the walls, proper insulation, heating and cooling systems, air infiltration through doors and windows, water and lighting systems—all are critical.

Building performance standards that take this overall "thermal performance" (measured in Btus—British thermal units) into account are the best kind of standards. They give designers and builders freedom to use their skills and ingenuity. They encourage such things as proper solar orientation of buildings, reduced air infiltration and efficiently-sized mechanical equipment. A true "performance standard" simply sets an energy conservation goal, expressed as an energy budget for an entire building, and then permits that goal to be achieved by the designer, builder, and owner in whatever ways they can devise.

2. *We can use the sun's energy to cut energy costs.* There are both "active" and "passive"



solar collectors. "Active" solar collectors collect energy from the sun and then use mechanical equipment such as pumps or fans to distribute that energy. "Passive" collectors simply collect the sun's heat and hold it until it is released by radiation or conduction.

No materials serve as "passive" collectors better than masonry—brick, concrete block, stone.

Passive solar collectors have many advantages over active solar collectors. They have no working parts—nothing to go haywire. They are simple to design and build—and they are more economical.

3. *Massive walls of masonry, even when they're not designed as passive solar collectors, keep buildings warmer in winter, cooler in summer.* Because of their weight, or mass, masonry walls act like thermal blankets. In many cases, masonry walls will mean that heating/cooling systems can be reduced in size.

4. *Insulation is important when properly used, and when its limitations are understood.* We are still learning about the limitations. It's already clear that insulation is cost-effective only when used with restraint. After a certain point of thickness has been reached, the cost of additional insulation will no longer be recovered in energy savings.

And it's becoming clear that some assumptions made in the past about insulation are not justified. For example, there are indications from preliminary studies that in regions where more energy is expended in cooling than in heating, insulation used in the standard fashion in all walls may actually increase, instead of reduce, energy consumption.

One of insulation's limitations is that it affects only conduction—it doesn't affect air leakage, which is estimated to account for 25-30 percent of the thermal loss in buildings. A significant amount of air leakage occurs through windows and doors, so it's important to reduce the size of, and shield, these openings.

Masonry walls will further reduce air leakage because they are hand-fitted on the site (like custom-made suits) and thus are more airtight.

Furthermore, the effectiveness of insulation depends on the wall to which it is attached. Promoters who compare wall materials with insulation are making a meaningless comparison—the two have different functions, and one is not a substitute for the other.

Keeping to a strict Btu budget for your buildings is important today and will be even more so tomorrow.

Masonry Institute of Washington
2366 Eastlake Ave. E.
Seattle, WA. 98102
(206) 329-0898

L. E. (Gene) Salveson
Executive Director

Insulated-comfort control

With Thermal-Barrier Hollow Metal by Barclay Dean, Inc.

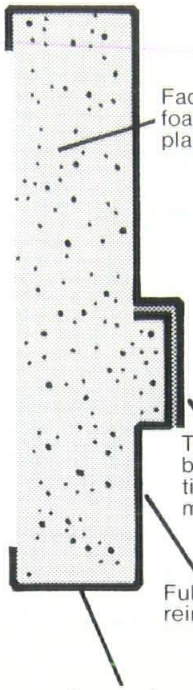
Thermal-Barrier Hollow Metal Openings

SPECIFICATION FEATURES:

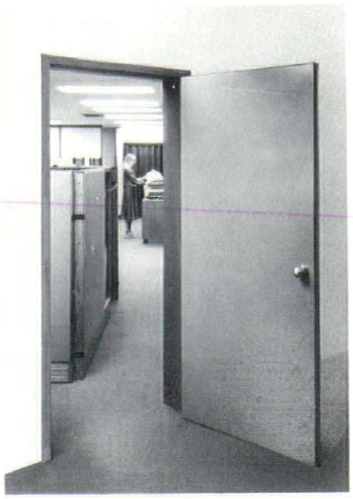
Because of its long time experience with the problems of hollow metal in the Northwest and Alaska, Barclay Dean has developed a locally made, custom designed thermal break frame for exterior openings. The short Alaska construction cycle requires early delivery of exterior hollow metal frames. We have the facilities for local custom fabrication, engineering, and follow-up and therefore can meet short delivery schedules. To best accomplish this and because of heat conservation requirements we present the first tried and tested* thermal break frame. We provide a complete thermal *and* electrical separation. There are no frame size restrictions and no restrictions on the architects selections of hardware.

The Barclay Dean thermal break frame complete with Fenestra's strong Presidential M.D. insulated door provides the strongest and MOST ENERGY TIGHT door opening package available to the architect today.

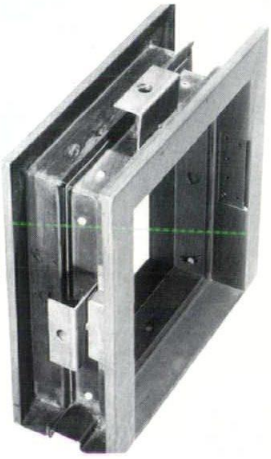
Let our thermal barrier frames open the door to Barclay Dean's complete line of quality products: Pella windows, Hough partitions, Liskey access floors, Landscape partitions and Hollow Metal.



Custom frame depths for all exterior wall conditions.



Fenestra MD insulated thermal barrier all-steel doors for strength and durability.



Standard 3-sided frames available from Seattle in weeks not months.

SPECIFICATIONS:

DOOR

16 ga galvanized steel skin. Full welded grid construction. 7# Mineral wool insulation.

μ = .33. full edge weld, Dura-Suede primer, 10 year factory warranty.

FRAME

14 ga galvanized steel. Factory insulated, no thermal or electrical conductance, 9" × 3/16" hinge reinf., μ = .693.

*Per ASTM test #C236-66.

BARCLAY DEAN, Inc.

SEATTLE • ANCHORAGE • YAKIMA

Western Washington Solar Energy Association

The Western Washington Solar Energy Association (WeWaSEA) is a grass roots organization formed in 1978 by those interested in furthering the use of solar energy — in households, business, government and the community. Our concern for solar energy includes direct and indirect solar radiation, wind, renewable biological products and other facets of energy conservation and renewal. Members include interested individuals and energy professionals in many fields. This variety of personal input helps WeWaSEA to achieve its main purpose of being a link between people who want timely and credible information on solar energy and the professionals and groups who can provide such aid. This purpose is supported by a monthly newsletter and meetings, tours, speakers, films, equipment displays, legislation and tax updates as well as professional discussions on solar design, maintenance and installation.

WeWaSEA serves Washington State west of the Cascades. We are a subchapter of the Pacific Northwest Solar Energy Association (PNWSEA) which is an affiliate of the American Section of the International Solar Energy Association.

Committees include program, legislation, library, publicity, technical review and workshop. WeWaSEA was the host of SOLAR '79, a conference of displays, speakers, technical presentations and the Solar Olympics. The conference involved several thousand people in events of interest not only to professionals, but to the general public.

Source: Western Washington Solar Association News

Indoor Climate Control
Job Profile #2843

Goal: BANKING COMFORT WITH ENERGY SAVINGS

Project: Cascade Savings & Loan Association, Bellevue Branch

Architect: Joseph L. Williams, Inc.

Interior Design: Swift & Williams Interiors

Job Specs: Engineer, fabricate and install the heating, air conditioning and ventilation system for the 6,400 sq. ft. building

System: General Electric WEATHERTRON® Heat Pumps . . . two 3-ton units, one 4-ton and one 7½-ton unit

The Bellevue branch of Cascade Savings & Loan Association is located at 200 108th N.E. Business hours are 9:00 a.m. to 5:00 p.m. Monday through Thursday and 9:00 a.m. to 6:00 p.m. Friday. For information concerning insured savings, home loans and other financial services call (206) 455-2300. Member FSLIC.

INDOOR CLIMATE CONTROL'S assignment for the project was to provide a comfortable environment for Cascade Savings & Loan Association's customers and employees within four individual zones. Energy conservation was of primary concern in this virtually all glass building with open east, south and west exposures and 21 foot high ceilings. The high "heat gain and loss" challenge was solved by the General Electric WEATHERTRON® heat pumps, double glaze Thermopane glass, Zonolite roofing and 15 foot overhangs. In our Northwest climate, GE heat pumps produce proven savings of up to 60% when compared to fossil fuel systems.

INDOOR CLIMATE CONTROL

2310 S.W. Spokane Street
Seattle, WA 98106

(206) 937-9930

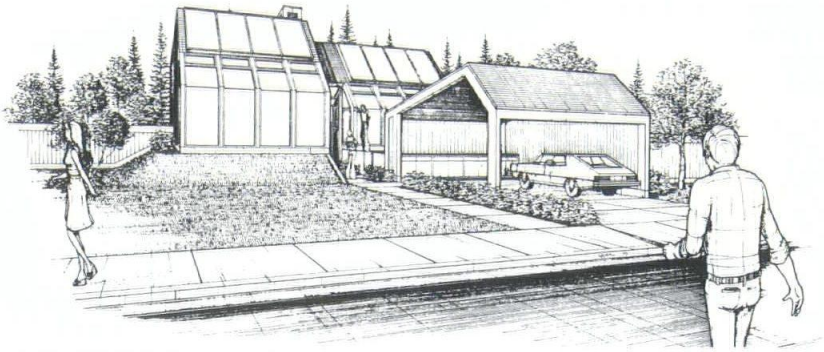
Innovations in Housing

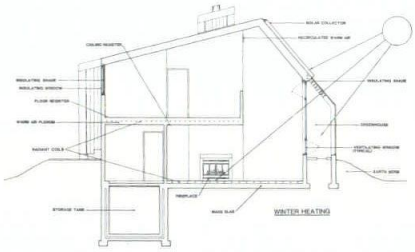
Innovation, economy and a lot of common sense went into the plans for the award winning design of a single family home that won top honors in the nationwide *1979 Innovations in Housing* residential design competition. Two Spokane architects, Dale R. Leyse, with Steve Ronald & Associates, and associate Daniel L. Griffith, Tan/Brookie/Kundig Architects, received the $5,000 First Award in the program sponsored by the American Plywood Association, *Better Homes and Garden* and *Progressive Architecture* magazines. The winning house plan was one of eight original designs selected as award winners from 390 entries of architects, designers and students in the United States, Canada and Europe.

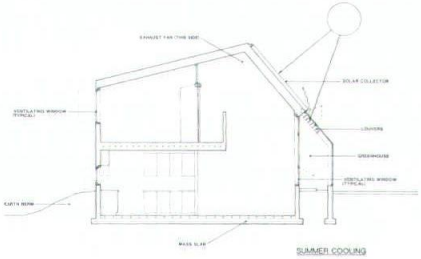
The criteria called for a basic house with living space not to exceed 1700 sq. ft., combining economical construction methods and energy-efficient heating and cooling systems. The plan must also be flexible enough to permit future expansion.

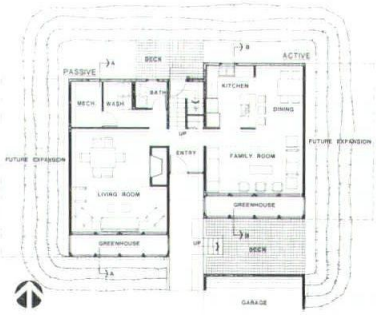
The warm, contemporary character is pleasing and non-regional, suitable for siting anywhere. The plans include three structural elements — two house sections and a detached garage. The floor plan is compact, yet contains a family room and formal dining area. Although basically an open plan, the family living space and the teen and adult entertainment areas are separated.

Primary planning was for the heating-cooling systems. An all-water solar space heating and hot water system were combined for efficient, energy-conserving heating. Hot water collected in flat-plate solar panels is piped through the









domestic water heater which has an auxiliary boiler and is circulated through a network of copper coils, transmitting radiant warmth to the home's lower level. Heat transported to the upper floor via a warm air plenum is recaptured, reheated by radiant coils in the plenum and recirculated.

An all-glass greenhouse, located along the southern side of the house, is the key element in a passive solar collection system. A fireplace provides supplementary space heating.

Other unique energy-conserving devices include earth berms that protect lower walls from winter heat loss and summer heat gain; landscaping with coniferous trees on the north exposure for wind protection with deciduous trees on the east and west for summer shade. A low north roof slope retains snow for additional insulation in the winter.

People

Steve McNutt and **Fred King** have been named associates at Tan/Brookie/Kundig, Architects, a Spokane architectural firm.

Edward M. Musgrove, AIA, a principal in the Spokane firm of Environmental Concern, Inc., has been elected president for the Pacific Northwest Regional Conference/Council of Educational Facility Planners, International.

Kenneth W. Johnson has joined the staff of Northwest Lath & Plaster Bureau as an architectural consultant, assisting with technical framing and lathing systems in commercial projects. He will be located in the Seattle office.

Joey Ing, AIA, has been appointed to the City of Redmond Architectural Review Board.

Bartow Consultants, Architects-Planners, have expanded offices and services to 58 Front Street North, Room 200, Issaquah.

El Baylis Associates, Architects, announces incorporation under a new name: The Baylis Architects. **Brian Brand** and **Richard Wagner**, vice presidents, join **El Baylis** as directors of the firm. Offices are at 500 - 108th Avenue N.E., Bellevue.

Benjamin Weeks has been named chairman of the Board for The Leckenby Company, Seattle-based steel fabricating and engineering firm. **Alex Kunzler**, formerly vice president of operations, has been named president and chief operating officer.

Arnold N. Andring, AIA, announces that **Alan E. Gozart** has become a partner in the firm with a resultant name change to Andring & Gozart AIA, Architects and Planners. **Eugene H. Smith** has joined the firm as an associate. Offices are located at 316 N. Broadway, Aberdeen.

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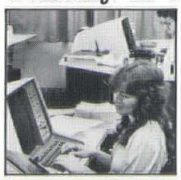

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People

Richard Carothers Associates, P.S., a Planning, Landscape Architect and Urban Design Firm with offices in Seattle and Boise, has opened an office in Reston, Virginia in associate with Design Resource Associates of Reston. Principal in charge of the Reston office is **John Gattuso**, ASLA.

Skyline Associates, Architects/Solar Consultants, has recently been formed with offices at 106 S. Pine Street, Burlington. Principals in the firm are **Robert Hall, Gary Kienast** and **Graham Hubenthal.** General architectural services will be performed with special emphasis on solar-heated residential and commercial developments.

Vanna H. Ishimaru has been appointed affirmative action director of The National Electrical Contractors Association in a new Affirmative Action Program for the electrical construction industry. It is a pilot program in the construction industry, the first of its kind in the United States.

The firm of Rigg Nelson Walker Courage, Architects, P.S., Seattle, has dissolved and the new firm of Nelson/Walker, Architects, P.S., has been announced. **Albert W. Nelson, Jr. AIA,** and **Timothy Walker, AIA,** are the sole owners of the corporation with Nelson as president and Walker as secretary-treasurer. The offices remain at 1219 Westlake Avenue North, Suite 200, Seattle. The Anchorage office, Wran-Kumin, Inc. will continue with **Jon Kumin** as partner-in-charge.

Donald A. Lemm has been appointed business manager for Janes Bros., Bellevue.

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News

New Seattle Energy Code

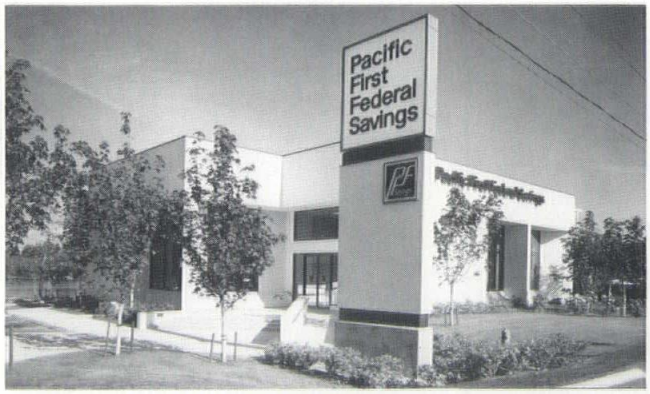
On February 20, 1980, Seattle's new Energy Code goes into effect. As of this date, any plans submitted to the city's Building Department for permits will be required to be in compliance. The new Energy Code will apply to all new construction, and to any elements that are changed in existing buildings through alterations, additions or repairs. The code is designed to supplement the city's Electrical, Mechanical, and Building Codes, but if there is any conflict, the provisions of the Energy Code will apply.

According to William J. Justen, Superintendent of Buildings, the new code will provide minimum standards to achieve more efficient utilization of energy. It represents the outcome of a sustained, careful review of energy code issues by the city's staff, elected officials, and a special Task Force of concerned citizens from building related professions. The Task Force, under the leadership of Chairman Al Bek, Senior Vice-President of the Howard S. Wright Co., performed a major role in the development of the code.

The new Energy Code is based on ASHRAE Standard 90-75, adapted to Seattle's particular needs and circumstances. It allows for a building to comply by taking one of three paths:

1) A standard approach which specifies performance requirements for each significant component of a building.

2) An alternate design approach which allows innovative new developments to be used so long as they



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Exterior: Portland Cement Plaster

Interior: Veneer Plaster System

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News

do not result in any increased energy consumption compared to the standard component approach.

3) A simple prescriptive approach which sets energy efficient standards for the principal energy related elements and systems in a building: The building envelope, mechanical heating and cooling systems, plumbing, and electrical distribution and lighting.

An Energy Manual is in preparation by the Seattle Building Department to assist in understanding the code and a series of educational seminars are planned.

Emergency Building Temperature Restrictions Program

On July 16, 1979 Federal regulations became effective prescribing specific heating, cooling, and hot water temperature restrictions for commercial, industrial and other non-residential buildings. The law requires that building operators use no energy to cool the building below 78 degrees or to heat the building above 65 degrees, and that domestic hot water not be heated above 105 degrees. Buildings such as private residences, health care facilities, the sleeping rooms of hotels and other lodging facilities, elementary schools, nursery schools and Day-Care centers are excluded from the program.

Civil penalties of up to $5,000 per day and criminal penalties of up to $10,000 per day are prescribed for violations of the law although the major enforcement emphasis will be on information, education and voluntary compliance.

Exemptions, which the building owner or operator may "self certify," are available for protection of special equipment which requires other temperature levels, to protect materials and equipment, to provide for the proper storage or handling of food or agricultural goods, to protect the health of persons in certain situations, to prevent structural damage to buildings, and to protect plant or animal life which is essential to a business.

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ERRATUM

The Comment page, "The Waste of Urban Sprawl" by Gordon Ruehl, AIA, which appeared in the July/August issue of *Northwest Architecture*, contained a serious typographical error in a monetary reference.

The third paragraph of the article which discussed the King County study of "managed" versus "continuing trend" growth patterns noted the added cost for utility services under continuing growth trends will exceed managed growth expenditures by *$528 billion.* (The figure should have been written as $528 million.)

Comment Page continued

energy efficiency of a car in terms of miles per gallon.

Additional energy savings can be achieved by the use of alternative sources of energy, such as sun, wind, and water. Solar energy appears to be the most promising resource, in terms of immediate availability and existing technology.

There are major benefits to be derived from energy efficient building in addition to reduced operating costs over the building's lifetime. First, a decrease in fossil fuel consumption would help alleviate the pollution hazards associated with the conversion of those fuels into energy. Second, the elimination of the need to import 12.5 million barrels of oil a day into the United States would avoid the staggering burden that otherwise would be placed on the U.S. international balance of payments. Finally, the creation of an energy efficient built environment would provide an estimated two to three million job opportunities annually in construction and industries.

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In The Next Issue...

A thoughtful article on "Energy-Conscious Design" will be included in the November/December issue of *Northwest Architecture*. It is written by Donald F. Burr, FAIA, member of the American Institute of Architects' National Committee on Energy, and one of six members of a steering committee who write energy policy for the American Institute of Architects.

Don Burr is also one of three charged with the responsibility of writing the AIA Energy Action Plan for 1980-1985. His further credentails include chairing the International Energy Committee of the Council of Educational Facility Planners, International.

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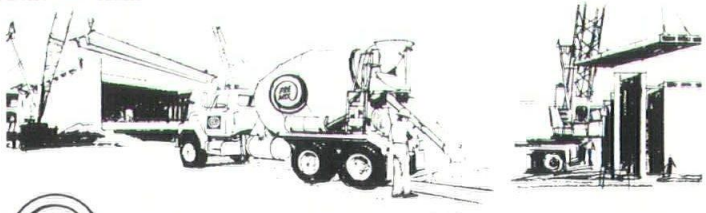

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Letters

To the Editor:

The Waste of Urban Sprawl is a direct response to the demands of the American Public. But, the American dream of a single family home and the market response to this demand is only one half of the equation. The other half lies in public opposition to increasing density within built-up areas. Until this problem is solved, the regional perspective required to avoid sprawl cannot be instituted.

In Seatle, abortive attempts have been made to plan higher density housing on hill tops, on Queen Anne and on Lake Union. In desperation high density housing was suggested for the Denny regrade area where in place a community council sprang up and the City is reconsidering zoning in this area.

We have just witnessed adoption of Seattle's new single family neighborhood policies, policies which, if extrapolated, will produce a Los Angeles on Puget Sound. At the time major County efforts have been directed at stopping outlying growth. Given the limitations on infill development, a housing shortage has resulted and prices have soared. Rent controls have been proposed further discouraging infill housing.

Unfortunately, architects have been in the forefront of these neighborhood responsive activities and rarely address the regional aspects of the total hosing system. Our only consolation is that we're no worse than the other folks who built Los Angeles.

Edward M. Burke, AIA, AIP
The Burke Associates
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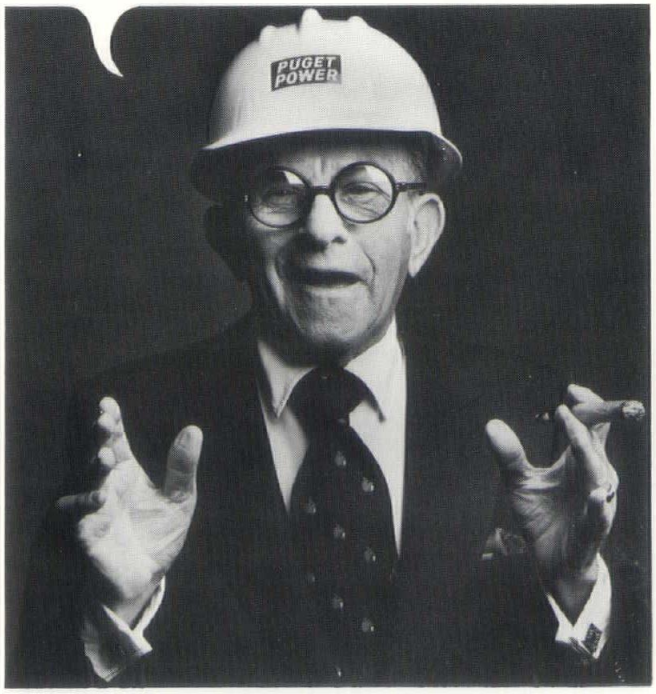

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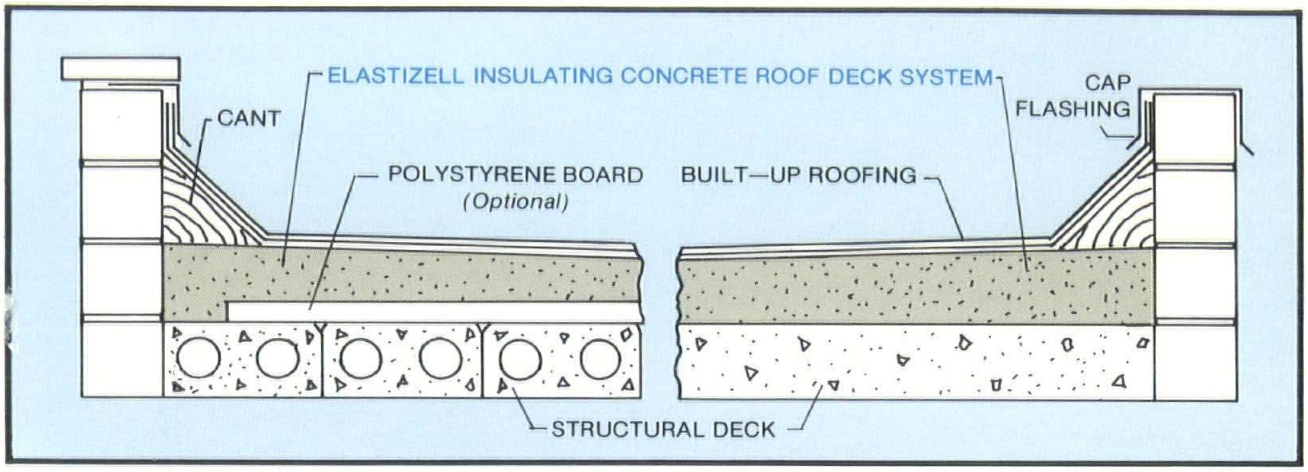

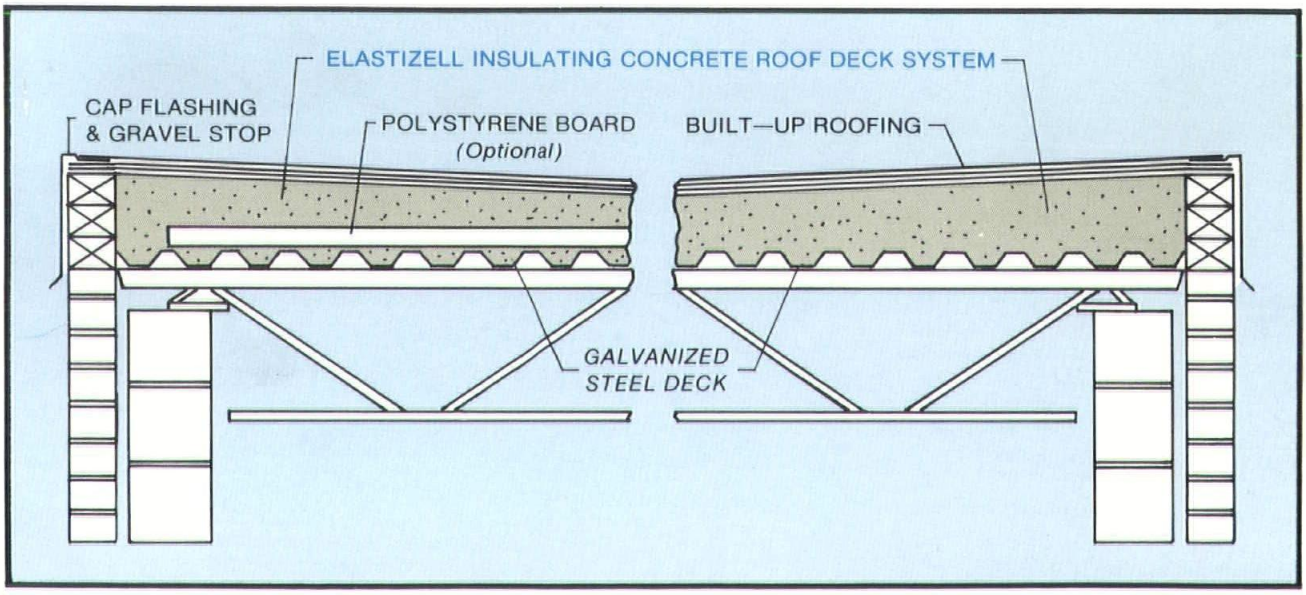

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